

1                   **TITLE OF THE INVENTION**

2                   **TENSION MASK FOR COLOR CRT, METHOD FOR MANUFACTURING**

3                   **THE TENSION MASK, AND EXPOSURE MASK USED IN THE**

4                   **MANUFACTURE OF THE TENSION MASK**

5                   **CLAIM OF PRIORITY**

6       [0001] This application makes reference to, incorporates the same herein, and claims all benefits  
accruing under 35 U.S.C. §119 from an application entitled *Tension Mask for Color Picture Tube*  
*and Method of Manufacturing the Same and Exposure Mask for Making the Tension Mask* earlier  
filed in the Korean Industrial Property Office on 20 April 2000, and there duly assigned Serial No.  
20994/2000 by that Office.

12                  **BACKGROUND OF THE INVENTION**

13                  **Field of the Invention**

14       [0002] The present invention relates to a color cathode-ray tube (CRT), and more particularly, to  
a tension mask having a color selection function, which is secured into the panel of a cathode-ray  
tube, a method for manufacturing the tension mask, and an exposure mask for use in the manufacture  
of the tension mask.

17                  **Description of the Background Art**

18       [0003] In color cathode-ray tubes for television and computer displays, three electron beams

1 emitted from an electron gun land onto a phosphor screen installed on the inner side of a panel  
2 through apertures of a mask having a color selection function, to excite red, green, and blue  
3 phosphors deposited on the phosphor screen, thereby forming images.

4 [0004] In a color cathode-ray tube, which forms images with the above-mentioned structure, the  
5 mask having a color selection function includes a dot mask for computer monitors, and a slot mask  
6 (or slit mask) for televisions. The dot mask and the slot mask are designed to have a predetermined  
7 curvature corresponding to a curvature of the phosphor screen, which has been curved taking into  
8 account a deflection trajectory of electron beams onto the phosphor screen.

9 [0005] Such masks are made of steel foil having a thickness of 0.1-0.25 mm (millimeters). A  
10 plurality of apertures are formed in the steel foil via etching, and then the steel foil is molded to have  
11 a predetermined curvature. If the curvature of the mask is less than a predetermined level, the mask  
12 is readily subjected to a permanent thermal distortion. As a result, the mask cannot perform its  
13 intrinsic color selection function. There is an increasing need for flat cathode-ray tubes. However,  
14 there are limitations in the manufacturing of flat cathode-ray tubes having the above-mentioned  
15 configuration.

16 [0006] A slot mask suitable for flat cathode-ray tubes, which is free from doming caused by  
17 thermal expansion, is disclosed in U.S. Patent No. 4,942,332 issued to Adler et al. for *Tied Slit Mask*  
18 for Color Cathode Ray Tube. The slit-type foil tension mask includes a series of parallel strips  
19 separated by slits. The strips are loosely coupled by widely spaced ties.

20 [0007] Another mask, which is disclosed in U.S. Patent No. 4,926,089 issued to Moore for *Tied*  
21 *Slit Foil Shadow Mask with False Ties* includes a plurality of tie bars interconnecting adjacent strips

1 and to define slots, and a plurality of false bars extending between the adjacent strips to face each  
2 other, but not interconnecting the adjacent strips.

3 [0008] In general, such a tension mask having the above configuration is manufactured by  
4 photolithography. In particular, a photosensitive layer is deposited over both sides of a steel foil,  
5 exposed to an exposure light using an exposure mask to form a predetermined pattern, and then  
6 etched, so that a complete mask is obtained.

7 [0009] For the tension mask formed by the earlier techniques, the width of the slot between the  
8 adjacent strips at the electron beam emitting surface of the mask, is larger than the width of the slot  
9 at the electron beam entering side of the mask. An etching boundary, where etching from the upper  
10 and lower sides of the steel foil stops, is located close to the bottom surface of the resultant tension  
11 mask. That is, the distance from the top surface of the strip to the etching boundary is larger than  
12 the distance from the bottom surface of the strip to the etching boundary. As a result, the incident  
13 angle of electron beams passing the slot is small, so that the amount of beam passing through the slot  
14 decreases.

15 [0010] On the other hand, because the gap between the adjacent upper second light shielding  
16 portions of the upper exposure mask is equal to that between the adjacent lower second light  
17 shielding portions of the lower exposure mask, etching boundaries for the false bars of the tension  
18 mask, which extend from the adjacent strips, is located at a position separated by the same distance  
19 from the top and bottom of the strips. Unfortunately, the etching boundaries located in the middle  
20 of each false bar cause clogging of the gap between the adjacent false bars in the manufacture of the  
21 mask. In addition, if the gap between the false bars is widened so as to prevent clogging of the gap,

1 a problem of false bar visibility occurs when the mask is adopted in a cathode-ray tube.

2 [0011] On the other hand, the gap between the false bars is limited by the thickness of the steel  
3 foil used. Earlier etching techniques applied in the manufacture of masks is insufficient to form a  
4 mask having a fine pattern, which is not shown on the screen when the mask is secured into the panel  
5 of a cathode-ray tube. In particular, although a steel foil which is thin ensures a smaller gap between  
6 adjacent false bars, the use of the thin steel foil increases the manufacturing costs, and lowers  
7 strength of the mask.

## SUMMARY OF THE INVENTION

8 [0012] It is therefore an objective of the present invention to provide a tension mask for a color  
9 cathode-ray tube (CRT), in which variations in gaps between facing dummy bridges are reduced by  
10 adjusting the shape and thickness of real bridges and dummy bridges of the tension mask, thereby  
11 preventing the problem of bridge visibility.

12 [0013] It is another objective to provide a method for manufacturing a tension mask for a color  
13 cathode-ray tube, in which a desired pattern of the tension mask including slots, real bridges and  
14 dummy bridges can be obtained irrespective of the thickness of a steel foil selected to form the  
15 tension mask.

16 [0014] It is yet another objective to provide an exposure mask for use in manufacturing the tension  
17 mask.

18 [0015] Accordingly, to achieve the above objectives, there is provided a tension mask for a color  
19 cathode-ray tube including a series of parallel strips separated by a predetermined distance from each

1 other, a plurality of real bridges intersecting adjacent strips among the series of parallel strips to  
2 define slots through which electron beams pass, and a plurality of dummy bridges located in the  
3 slots, partially extending between but not intersecting the adjacent strips, facing each other, where  
4 an etching boundary of each of the dummy bridges is located below the middle of the strips.

5 [0016] It is preferable that the plurality of real bridges are recessed by a predetermined depth from  
6 the top surface thereof. The distance from the bottom of the strips to the etching boundaries of the  
7 dummy bridges may be 0.25 times smaller than the thickness of the strips. It is preferable that the  
8 thickness of each of the real bridges at the recessed center thereof is approximately the same as the  
9 distance from the bottom of the strips to the etching boundaries of the dummy bridges.

10 [0017] In another embodiment of the present invention, a tension mask for a color cathode-ray  
11 tube includes a series of parallel strips separated by a predetermined distance from each other, a  
12 plurality of real bridges intersecting adjacent strips among the series of the parallel strips to define  
13 slots through which electron beams pass, and a plurality of dummy bridges located in the slots,  
14 partially extending between but not intersecting the adjacent strips, facing each other, where an  
15 etching boundary of each of the dummy bridges is located below the middle of the strips, the tension  
16 mask including a pair of first rounded portions formed with a first thickness at the beam emitting  
17 side of each of the slots, partially extending from the adjacent strips, and a pair of second rounded  
18 portions formed with a second width at the beam entering side of each of the slots, partially  
19 extending from the adjacent strips.

20 [0018] A method for manufacturing a tension mask for a color cathode-ray tube (CRT) includes  
21 depositing photosensitive layers over the top and bottom surfaces of a steel foil, aligning an upper

1 exposure mask with a pattern including a series of parallel upper light transmission portions arranged  
2 in lines over the top surface of the steel foil, aligning a lower exposure mask with a pattern over the  
3 bottom surface of the steel foil, the pattern of the lower exposure mask including a series of parallel  
4 lower light transmission portions arranged in lines, a plurality of first light shielding portions  
5 intersecting adjacent lower light transmission portions among the series of the parallel lower light  
6 transmission portions, and a plurality of second light shielding portions partially extending between  
7 the edges of the adjacent lower light transmission portions, exposing the photosensitive layers  
8 uncovered with the lower and upper exposure masks using an exposure light source, removing the  
9 upper and lower exposure masks from the steel foil and developing the photosensitive layers  
10 remaining on the steel foil, and etching the steel foil which has undergone the developing process.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0019] A more complete appreciation of this invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

[0020] FIG. 1 is a plan view of a conventional mask for a cathode-ray tube (CRT);

[0021] FIG. 2 is a plan view of another mask for a cathode-ray tube;

[0022] FIGS. 3A through 3C illustrate an earlier method for manufacturing a mask;

[0023] FIG. 4 is a sectional view taken along line a-a of FIG. 2;

[0024] FIG. 5 is a sectional view taken along line b-b of FIG. 2;

- 1 [0025] FIG. 6 is an exploded perspective view of a cathode-ray tube into which a preferred  
2 embodiment of a tension mask according to the present invention is secured;
- 3 [0026] FIG. 7 is a plan view of the tension mask of FIG. 6;
- 4 [0027] FIG. 8 is an enlarged perspective view of the tension mask shown in FIG. 7;
- 5 [0028] FIG. 9 is a sectional view taken along line c-c of FIG. 8;
- 6 [0029] FIG. 10 is a sectional view taken along line d-d of FIG. 8;
- 7 [0030] FIG. 11A and 11B are sectional views taken along line e-e of FIG. 8;
- 8 [0031] FIG. 12 is a perspective view of another embodiment of the tension mask according to the  
present invention;
- 9 [0032] FIG. 13 is a perspective view illustrating passing of an electron beam through a slot of the  
tension mask according to the present invention; and
- 10 [0033] FIGS. 14 through 19 illustrate a method for manufacturing a tension mask according to  
the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

- 11 [0034] Turning now to the drawings, as shown in FIG. 1, disclosed by U.S. Patent No. 4,942,332  
12 issued to Adler et al. for *Tied Slit Mask for Color Cathode Ray Tube*, the mask includes a series of  
13 parallel strips 22 separated from each other by a predetermined distance, and a plurality of tie bars  
14 23 interconnecting the adjacent strips to define the slots 21 at predetermined intervals. Referring to  
15 FIG. 2, another mask is constituted to include a plurality of tie bars 32 interconnecting adjacent strips  
16 31 and 31' to define slots 33, and a plurality of false bars 34 extending between the adjacent strips  
17 31 and 31' to define slots 33, and a plurality of false bars 34 extending between the adjacent strips  
18 31 and 31' to define slots 33, and a plurality of false bars 34 extending between the adjacent strips  
19 31 and 31' to define slots 33, and a plurality of false bars 34 extending between the adjacent strips  
20 31 and 31' to define slots 33, and a plurality of false bars 34 extending between the adjacent strips

1       31 and 31' to face each other, but not interconnecting the adjacent strips 31 and 31'.

2       **[0035]**     In general, such a tension mask having the above configuration is manufactured by  
3           photolithography. In particular, a photosensitive layer is deposited over both sides of a steel foil,  
4           exposed to an exposure light using an exposure mask to form a predetermined pattern, and then  
5           etched, so that a complete mask is obtained. An earlier method of manufacturing a mask will be  
6           described in greater detail with reference to FIGS. 3A through 3C.

7       **[0036]**    Referring to FIG. 3A, photosensitive layers 42 are coated over both sides of a steel foil 41.  
8           Following this, an upper exposure mask 43 and a lower exposure mask 44, which have a  
9           predetermined pattern, are put on both sides of the steel foil 41 having the photoresist layers 42, and  
10          irradiated with light (not shown), as shown in FIG. 3B. Here, the upper exposure mask 43 has a  
11          similar pattern to that of the mask described above. That is, the upper exposure mask 43 has a series  
12          of parallel upper light transmission slots 43a, which are completely or partially intersected by a  
13          plurality of upper first light shielding portions 43b, which correspond to tie bars of a mask to be  
14          formed, intersecting the upper light transmitting slots 43a, and a plurality of upper second light  
15          shielding portions 43c, which correspond to false tie bars of the mask. The lower exposure mask  
16          44 has a series of parallel lower light transmission slots 44a whose width W1' is smaller than the  
17          width W1 of the upper light transmission slots 43a, which are partitioned by a plurality of lower first  
18          and second light shielding portions 44b and 44c. The upper exposure mask 43 has a horizontal width  
19          W2 of the dummy slit 43d and the lower exposure mask 44 has a horizontal width W2' of the dummy  
20          slit 44d.

21       **[0037]**    The exposure masks having the above pattern are applied on the photosensitive layers 42

1 formed over the steel foil 41, and exposed to light. After the exposure, as shown in FIG. 3C, the  
2 resultant structure is developed, etched, and then spray-cleaned with a high-pressure cleaning  
3 solution 46, thereby resulting in a complete tension mask.

4 [0038] For the tension mask formed by the earlier technique, as seen in FIG. 4, the width W3 of  
5 the slot 33 between the adjacent strips 31 and 31' at the electron beam emitting surface of the mask,  
6 is larger than the width W4 of the slot 33 at the electron beam entering side of the mask. An etching  
7 boundary 35, where etching from the upper and lower sides of the steel foil stops, is located close  
8 to the bottom surface of the resultant tension mask. That is, the distance D1 from the top surface of  
9 the strip 31 or 31' to the etching boundary 35 is larger than the distance D2 from the bottom surface  
10 of the strip 31 or 31' to the etching boundary 35. As a result, the incident angle of electron beams  
11 passing the slot 33 is small, so that the amount of beam passing through the slot 33 decreases.

12 [0039] On the other hand, because the gap between the adjacent upper second light shielding  
13 portions 43c of the upper exposure mask is equal to that between the adjacent lower second light  
14 shielding portions 44c of the lower exposure mask, as shown in FIG. 5, etching boundaries 36 for  
15 the false bars 34 and 34' of the tension mask, which extend from the adjacent strips 31 and 31', is  
16 located at a position separated by the same distance from the top (D4) and bottom (D3) of the strips  
17 31 and 31'. Unfortunately, the etching boundaries 36 located in the middle of each false bar cause  
18 clogging of the gap between the adjacent false bars 34 and 34' in the manufacture of the mask. In  
19 addition, if the gap between the false bars 34 and 34' is widened so as to prevent clogging of the gap,  
20 a problem of false bar visibility occurs when the mask is adopted in a cathode-ray tube.

21 [0040] On the other hand, the gap between the false bars is limited by the thickness of the steel

1 foil used. For example, if the thickness of the steel coil is 0.10 millimeters, the adjacent false bars  
2 produced by etching have a gap of 0.05-0.07 millimeters. If the thickness of the steel coil is 0.05  
3 millimeters, the adjacent false bars produced by etching have a gap of 0.03-0.04 millimeters. The  
4 above mentioned etching technique applied in the manufacture of masks is insufficient to form a  
5 mask having a fine pattern, which is not shown on the screen when the mask is secured into the panel  
6 of a cathode-ray tube. In particular, although a steel foil which is as thin as 0.05 millimeters ensures  
7 a smaller gap between adjacent false bars, the use of the 0.05 millimeters thick steel foil increases  
8 the manufacturing costs, and lowers strength of the mask.

9 [0041] A cathode-ray tube (CRT), into which a preferred embodiment of a tension mask according  
10 to the present invention is secured, is shown in FIG. 6. As shown in FIG. 6, a cathode-ray tube 60  
11 includes a panel 62 having on the inner side thereof a phosphor screen 61 with a predetermined  
12 pattern, a tension mask 70 installed on the inner side of the panel 62, which allows three electron  
13 beams emitted from an electron gun 65 to land onto each phosphor deposited on the phosphor screen  
14 61, and a frame 63 secured into the panel 62 to support the tension mask 70. The panel 62 is  
15 connected with a funnel 66 having a neck portion 64 and a cone portion 64', where the electron gun  
16 65 is inserted in the neck portion 64, and a deflection yoke 67 for deflecting electron beams emitted  
17 from the electron gun 65, such that the electron beams accurately land on each phosphor of the  
18 phosphor screen 61, is installed over the neck portion 64 and the cone portion 64'.

19 [0042] The tension mask 70, which allows three electron beams to accurately land on the  
20 phosphor screen 61 in the cathode-ray tube, is shown in greater detail in FIGS. 7 and 8. The tension  
21 mask 70, which is formed of a steel foil, includes a series of parallel strips 71 and 71' separated from

1 each other by a predetermined distance, and a plurality of real bridges 73 intersecting adjacent strips  
2 71 and 71', forming slots 72 through which electron beams pass. As shown in FIG. 9, each of the  
3 real bridges 73 may have a recession 73a with a predetermined depth. The thickness T1 at the center  
4 of the real bridge 73 is smaller than the thickness T2 of the strip 71.

5 [0043] As shown in FIG. 10, a plurality of dummy bridges 74, which are a plurality of projections  
6 74a and 74b partially extending between but not intersecting the adjacent strips 71 and 71', are  
7 disposed in the slots 72. An etching boundary 75 at the end of each of the projections 74a and 74b,  
8 where etchings from the top and bottom of the strips 71 and 71' stop, is located close to the bottom  
9 of the strips 71 and 71'. In other words, the distance D5 from the top of the strips 71 and 71' to the  
10 etching boundary 75 is larger than the distance D6 from the bottom of the strips 71 and 71' to the  
11 etching boundary 75. The distance D6 is preferably 0.25 or more times smaller than the thickness  
12 of the strips 71 and 71'. It is preferable that the distance D6 from the bottom of the strips 71 and  
13 71' to the etching boundary 75 of the dummy bridge 74 is substantially the same as the thickness T1  
14 at the center of the real bridge 73 having the recession 73a.

15 [0044] In the tension mask having the above pattern, as shown in FIG. 11A, the width of a slot  
16 72 adjacent to the strips 71 and 71', which has no dummy bridges 74, is different at the beam  
17 entering and emitting sides. In particular, the width W5 of the slot 72 at the beam entering side is  
18 narrower than the width W6 of the slot 72 at the beam emitting side. Etching boundaries 77 of the  
19 adjacent strips 71 and 71' are approximately located in the middle of the strips 71 and 71'. The  
20 distance D7 from the top of the strip 71 or 71' to the etching boundary 77 may be larger than the  
21 distance D8 from the bottom of the strip 71 or 71' to the etching boundary 77. It is preferable that

1 the relative position of the beam entering side of the slot 72 having the width W5 is shifted or  
2 extended toward the center of the tension mask in relation to the beam emitting side of the slot 72  
3 having width W6 as the location of the slot 72 comes closer to the periphery of the tension mask as  
4 seen in FIGs. 11A and 11B. In FIG. 11A the slot 72 is located toward the periphery of the tension  
5 mask. The width W5 is shifted more toward the center of the tension mask as seen by the electron  
6 gun 65 emits the electron beam A through the slot 72 to the phosphor screen 61. In FIG. 11B, the  
7 slot is located toward the center of the tension mask. The width W5 is located in the center portion  
8 with respect to the width W6, allowing the beam A from the electron gun 65 to pass through the slot  
9 72. The beam emitting side portion of the slot 72 having width W6 is etched, and the beam entering  
10 side portion of the slot 72 is etched away from the center of the beam emitting side portion W6 and  
11 toward the center of the tension mask as the slot 72 is formed toward the periphery of the tension  
12 mask. The etching on the beam emitting side having width W6 and the etching on the beam entering  
13 side of the tension mask having the width W5 creates the slot 72. The slot 72 allows the electron  
14 beam A to pass through to the phosphor screen 61. The center of the tension mask can be defined  
15 as the center line  $C_L$  as seen in FIG. 7. As the slots 72 are located toward the periphery P, the width  
16 W5 is shifted more toward the center line  $C_L$  of the tension mask 70 with respect to width W6 of the  
17 slot 72. The shift of the width W5, reduces the clipping of the electron beams.

18 [0045] The area of the dummy bridges 74 can be varied. For example, the sum of the areas of the  
19 adjacent dummy bridges, *i.e.*, the projections 74a and 74b, may be progressively increased or  
20 decreased toward the periphery of the tension mask. In addition, the relative position of the gap  
21 between the projections 74a and 74b can be increasingly shifted as proximity to the periphery of the

1 tension mask increases, so that the degree of clipping of electron beam decreases.

2 [0046] Another embodiment of the tension mask according to the present invention is shown in  
3 FIG. 12. As shown in FIG. 12, the tension mask 80 includes a series of parallel strips 81 and 81'  
4 separated from each other by a predetermined distance, a plurality of real bridges 83 intersecting the  
5 adjacent strips 81 and 81' to form slots 82 through which electron beams pass, and a plurality of  
6 dummy bridges 84 located in the slots 82, which partially extend between but not intersecting the  
7 adjacent strips 81 and 81'. A first rounded (or curved) portion 85 with a first width W7 is formed  
8 at the light emitting side of the slot 82 along the edges of the adjacent strips 81 and 81', and a second  
9 rounded portion 86 with a second width W8, which is smaller than the first width W7, is formed at  
10 the light entering side of the slot 82.

11 [0047] Due to the presence of the first rounded portion 85 with the first width W7 at the beam  
12 emitting side of the slot 82, the real bridges 83 can be formed to be planar, rather than to have the  
13 recession 73a as in the embodiment described with reference to FIG. 8. The shapes of the adjacent  
14 strips 81 and 81' and of the facing dummy bridges 84 at the edges thereof are the same as those of  
15 the strips 71 and 71' and the dummy bridges 74, and thus descriptions thereof will not provided here.

16 [0048] As previously described, in the tension masks according to the present invention, the  
17 distance from the top of the strips to the etching boundaries of the dummy bridges is larger than the  
18 distance from the bottom of the strips thereto, and thus the gap between the etching boundaries of  
19 the facing dummy bridges can be reduced without causing clogging of the gap in etching the strips  
20 of the tension mask. As a result, the amount of electron beams passing through the gaps of the  
21 adjacent dummy bridges decreases, so that a reflection image of the dummy bridges is not shown

on the screen.

[0049] In addition, the width of each slot at the beam emitting side is wider than at the beam entering side, and the relative position of the slot at the beam entering side with respect to the beam emitting side is shifted toward the center of the tension mask. The real bridges are designed to have a recession, or the edges of the adjacent strips are designed to have rounded portions, so that clipping of electron beams passing through slots can be reduced. In particular, as electron beams emitted from the electron gun 65 (see FIG. 6) land onto the phosphor screen 61 through slots of the tension mask 70 after having been deflected by the deflection yoke 67, the amount of electron beams passing through the slots of the tension mask 70 increases at the center of the tension mask 70. This is because the edge boundaries of the adjacent strips are located in the middle of the strips, facing each other, thereby resulting in a maximum gap between the adjacent strips. Another reason is that each slot at the beam entering side is shifted with respect to the beam emitting side toward the center of the tension mask. As a result, the degree of clipping of electron beams decreases compared with a conventional tension mask.

[0050] Furthermore, as for the tension mask described with reference to FIG. 8, because the recession 73a with the thickness of T1 is formed at the top surface of each of the real bridges 73, a cross-sectional area 73b of the real bridge 73 decreases, thereby reducing clipping of electron beams 68 in a vertical direction, as shown in FIG. 13.

[0051] A method for manufacturing a tension mask having such a pattern described above, and an embodiment of an exposure mask for use in the manufacture of the tension mask will be described with reference to FIGS. 14 through 19. Referring to FIG. 14, a steel foil 91 is prepared and

1 photosensitive layers 92 are coated on the top and bottom surfaces of the steel foil 91. When the  
2 coating of the photosensitive layers 92 is completed, an upper exposure mask 100 and a lower  
3 exposure mask 200 are aligned over the top and bottom surfaces of the steel foil 91, respectively,  
4 as shown in FIG. 15.

5 [0052] The upper exposure mask 100 has a pattern including a series of parallel upper light  
6 transmission portions 101, which are slits arranged in lines. The width of each upper light  
7 transmission portion 101 is large enough to expose slots and a pair of first rounded portions of a  
8 desired tension mask. Preferably, the width of each of the upper light transmitting portions 101 is  
9 approximately two times the width of each slot of the tension mask. As shown in FIG. 16, the upper  
10 exposure mask 100 may have a plurality of upper light shielding portions 102 for real bridges of the  
11 tension mask, which intersect the upper light transmission portions 101, corresponding to a plurality  
12 of lower first light shielding portions 202 of the lower exposure mask 200 described below.

13 [0053] The lower exposure mask 200 has a pattern including a series of parallel lower light  
14 transmission portions 201, which are slits arranged in lines, a plurality of lower first light shielding  
15 portions 202 for real bridges, which intersect each of the lower light transmission portions 201, and  
16 a plurality of lower second light shielding portions 203, which partially extend between the edges  
17 of the lower light transmission portions 201. The width MW2 of the lower first light shielding  
18 portions 202 is wider than the width MW1 of the upper light shielding portions 102.

19 [0054] When the upper and lower exposure masks 100 and 200 are arranged over the top and  
20 bottom surfaces of the steel foil 91, as shown in FIG. 17, the photosensitive layers 92 coated on the  
21 steel foil 91, which are uncovered with the upper and lower exposure mask 100 and 200, are exposed

1 to an exposure light source 110. During the exposure process, the photosensitive layers 92 are  
2 uniformly irradiated with the exposure light source 110.

3 [0055] When exposing the photosensitive layers 92 is completed, the upper and lower exposure  
4 masks 100 and 200 are removed from the top and bottom surfaces of the steel foil 91, respectively,  
5 the resultant structure is developed using a developing solution, as shown in FIG. 18. Referring to  
6 FIG. 19, after the developing process, the steel foil 91 with the photosensitive layers 92 is etched in  
7 an etchant, and washed, thereby resulting in a complete tension mask.

8 [0056] As described previously, the exposure mask used in the manufacture of the tension mask  
9 according to the present invention has a simple pattern. That is, it is unnecessary to form the light  
10 shielding portions for both real bridges and dummy bridges, which was included in an earlier  
11 exposure mask, in both the upper and lower exposure masks. In addition, the gap between the facing  
12 dummy bridges of the inventive tension mask is narrower than that of an earlier tension mask, while  
13 the area of the cross-section of a single dummy bridge remains rigid.

14 [0057] As previously mentioned, in the tension mask and the method for manufacturing the  
15 tension mask with the inventive exposure mask including a fine pattern, the inventive tension mask  
16 has fine slots and real and dummy bridges, so that reflection images of the bridges are not seen when  
17 the tension mask is secured into a cathode-ray tube. In addition, the work time required for  
18 manufacturing the tension mask decreases due to use of the simple exposure mask, thereby  
19 improving the productivity of tension mask.

20 [0058] While this invention has been particularly shown and described with reference to preferred  
21 embodiments thereof, it will be understood by those skilled in the art that various changes in form

1 and details may be made to the described embodiments without departing from the spirit and scope  
2 of the invention as defined by the appended claims.

SEARCHED - OBTAINED